

Renewable Energy Databases, Information and GIS Tools

Dave Renné
National Renewable Energy Laboratory

Presented at the 2nd Energy Analysis Forum
29 May 2002





Objective of Talk

Renewable energy databases
+
Emission and air quality databases
+
Geospatial tools

||
Analytic capabilities



Outline

- Renewable energy resource databases
- GIS as a tool for integrating databases
- Examples of value-added products
- Applications to air quality mitigation analysis



Characteristics of Renewable Energy Resources

- Domestic source of clean energy
- Low or no “fuel” cost
- Consumption does not deplete supply
- Vary over space and time
- *Rate* of conversion generally controlled by amount of resource

Integration of resource data using Geographic Information System tools provides high value to planners and industry

How Assessments are Conducted

- **Measurements**
- **Empirical analyses**
- **Statistical analyses**
- **Modeling approaches**





Examples of Solar Resource Assessments

- National measurement programs
- U.S. National Solar Radiation Database (NSRDB)
- Solar radiation data “grids”
- Satellite-derived techniques



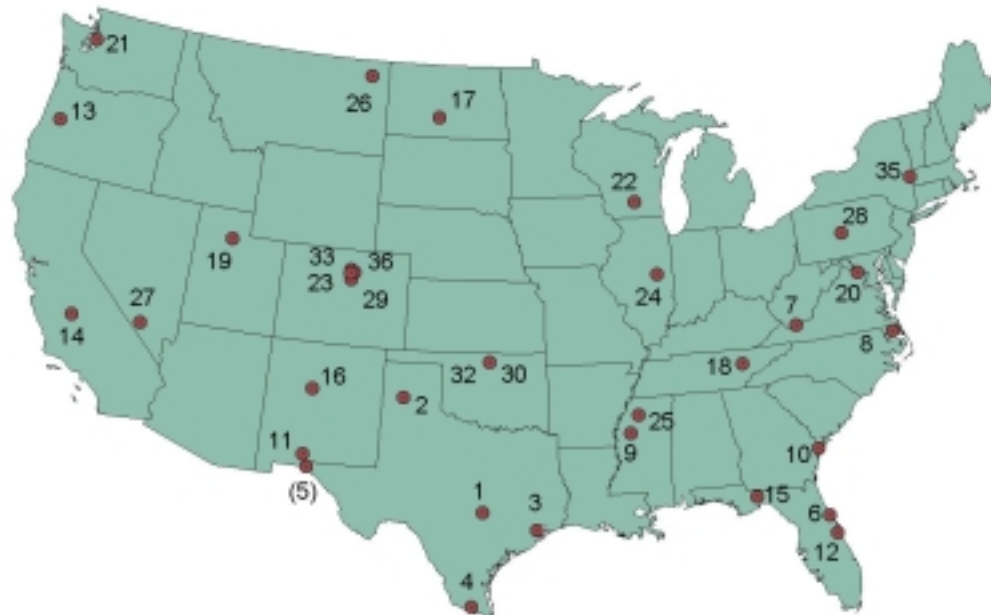
National Solar Measurements

INFORMATION ON NATIONAL AND REGIONAL SOLAR MONITORING NETWORKS

LOCATOR NUMBER	NETWORK	OPERATOR	STATION NAME	N LATITUDE (DEG.)	W LONGITUDE (DEG.)	START of MEASUREMENT
1	CONFRM	UNIVERSITY OF TEXAS SOLAR	EL PASO, TX	30.29	97.74	APRIL, 1997
2	CONFRM	UNIVERSITY OF TEXAS SOLAR	EL PASO, TX	34.99	101.9	JUNE, 1997
3	CONFRM	UNIVERSITY OF TEXAS SOLAR	EL PASO, TX	29.57	95.09	AUGUST, 1997
4	CONFRM	UNIVERSITY OF TEXAS SOLAR	EL PASO, TX	26.3	98.17	APRIL, 1997
5	CONFRM	UNIVERSITY OF TEXAS SOLAR	EL PASO, TX	31.77	106.5	JULY, 1997
6	CONFRM/HBCU	BETHUNE-COOKMAN COLLEGE	DAYTONA BEACH, FL	29.18	81.02	AUGUST, 1985
7	CONFRM/HBCU	BLUEFIELD STATE UNIVERSITY	BLUEFIELD, WV	37.27	81.24	NOVEMBER, 1985
8	CONFRM/HBCU	ELIZABETH CITY STATE UNIV	ELIZABETH CITY, NC	36.3	76.25	SEPTEMBER, 1985
9	CONFRM/HBCU	MISSISSIPPI VALLEY STATE UNIV	AMAR, MS	33.5	90.33	JULY, 1985
10	CONFRM/HBCU	SAVANNAH STATE UNIVERSITY	SAVANNAH, GA	32.03	81.07	AUGUST, 1985
11	CONFRM/OTHER	SW TECHNOLOGY DEV. INST.	ALBUQUERQUE, NM	32.27	106.74	MARCH, 1998
12	CONFRM/OTHER	FLORIDA SOLAR ENERGY CENT	MAUNA LOA, FL (1)	28.4	80.8	JANUARY, 2000
13	CONFRM/OTHER	U OF OR SOLAR ENERGY LAB	EUGENE, OR	44.05	123.07	MAY, 1975
14	ISIS	NOAA/ARL	HANFORD, CA	36.31	119.63	MAY, 1995 (2)
15	ISIS	NOAA/ARL	TALLAHASSEE, FL	30.38	84.37	JANUARY, 1995 (2)
16	ISIS	NOAA/ARL	ALBUQUERQUE, NM	35.04	106.62	JANUARY, 1995 (2)
17	ISIS	NOAA/ARL	BISMARCK, ND	46.77	100.77	JANUARY, 1995 (2)
18	ISIS	NOAA/ARL	OAK RIDGE, TN	35.96	84.29	JANUARY, 1995 (2)
19	ISIS	NOAA/ARL	SALT LAKE CITY, UT	40.77	111.97	APRIL, 1995 (2)
20	ISIS	NOAA/ARL	STERLING, VA	38.98	77.47	AUGUST, 1995 (2)
21	ISIS	NOAA/ARL	SEATTLE, WA	47.68	122.25	MARCH, 1995 (2)
22	ISIS	NOAA/ARL	MADISON, WI	43.13	89.33	JUNE, 1996 (2)
23	SURFRAD	NOAA/ARL	TABLE MT., CO	40.13	105.24	JULY, 1995 (3,4)
24	SURFRAD	NOAA/ARL	BONDVILLE, IL	40.05	88.37	APRIL, 1994 (3)
25	SURFRAD	NOAA/ARL	GOODWIN CREEK, MS	32.25	89.87	DECEMBER, 1994 (3)
26	SURFRAD	NOAA/ARL	FORT PECK, MT	48.31	105.10	NOVEMBER, 1994 (3)
27	SURFRAD	NOAA/ARL	DESERT ROCK, NV	36.62	116.02	JULY, 1995 (2)
28	SURFRAD	NOAA/ARL	PENN STATE U, PA	40.72	77.93	JUNE, 1998
29	SRRL	NREL	GOLDEN, CO	39.74	105.18	APRIL, 1985
30	ARM/SGP CF	USDOE	LAMONT, OK	36.61	97.49	NOVEMBER, 1992 (3)
31	ARM/NSA	USDOR	BARROW, AK	71.3	-156.68	JULY, 1997
32	ARM/SGP BSRN	NOAA/ARL	LAMONT, OK	36.61	97.49	JANUARY, 1995
33	BSRN	NOAA/CMDL	ERIE, CO (3)	40.05	105.01	JANUARY, 1992
34	BSRN	NOAA/CMDL	BARROW, AK	71.32	156.61	JANUARY, 1992 (3)
35	IDMP	ASRC, SUNY/ALBANY	ALBANY, NY	42.42	73.51	OCTOBER, 1991
36	CMDL	NOAA/CMDL	BOULDER, CO (6)	39.99	105.26	1975
37	CMDL	NOAA/CMDL	MAUNA LOA, HI	19.54	155.58	1976

NOTES:

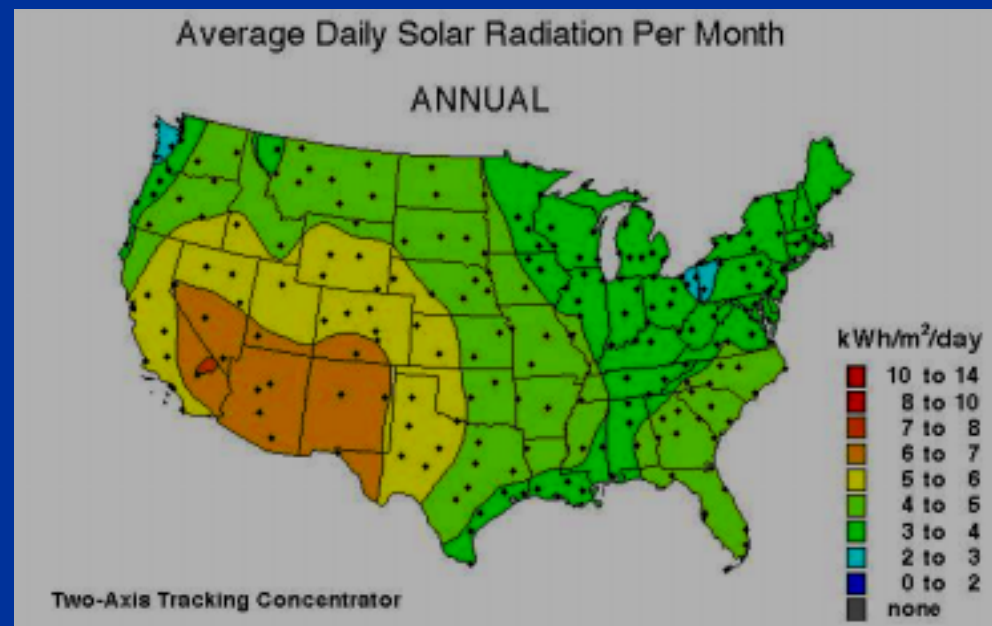
- (1) Eighteen years of data from previous site in Cape Canaveral, FL; 15 km east of present site
- (2) Earlier data at or near this site available through the National Climatic Data Center, Asheville, NC
- (3) Also designated as a BSRN station
- (4) Boulder Atmospheric Observatory, Located near Erie, CO
- (5) Earlier data available through the CMDL web site
- (6) Located at 325 Broadway (Moved to this location from 30th and Marine St. in 1999)





The National Solar Radiation Database

- Hourly data: 1961-1990
- 239 Stations
- Statistical summaries
- Various collector orientations
- 95% of data are modeled



Solar Radiation Data Grids

- 40-km resolution
- Monthly averages: 1985-1991
- Modeled values
- Various collector orientations

